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On the pathological examination of three eyes lost from concussion.

By E. TREACHER COLLINS.

THE three eyes lost from concussion which I wish to bring before you this evening were all removed from youthful patients, their ages respectively being six, sixteen, and eleven years. Each was injured by a blow from a blunt object, which caused only a slight corneal abrasion externally. In none of them was there any perforating wound. The symptoms presented in all three cases were marked deepening of the anterior chamber, hyphæma, diminution of tension, and deterioration of vision. Case 2 had no perception of light. Cases 1 and 3 could only distinguish hand movement. In Case 1 the pupil was dilated and the iris tremulous; in Case 2 the pupil was described as irregular; and in Case 3 the iris had quite disappeared.

The lens was seen to be cataractous and displaced upwards in Cases 1 and 2, its lower margin being visible in the pupil. The interval between the receipt of injury and the removal of the eye was in Case 1 eight days, Case 2 fifteen days, and Case 3 thirteen days.

Pathological examination of these eyes revealed a lesion of which I have been unable to find any reference in the text-books on diseases of the eye, or in treatises especially devoted to its injuries. In the first two cases the fibres of the ligamentum pectinatum which pass to the base of the iris had been torn across, and the ciliary muscle was split in its entire circumference, so that the angle of the anterior chamber was prolonged outwards. The split in

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the ciliary muscle separated its longitudinal from its circular fibres. These latter, together with the iris and lens, had fallen back, thus producing the deepening of the anterior chamber (Plate VI, figs. 1, 2, and 3).

In Case 3 there was a more extensive rupture of the fibres of the ligamentum pectinatum; not only were those which go to the base of the iris torn across, but also those which give origin to the ciliary muscle. The muscle itself, which was but slightly torn, had become separated from the sclerotic (Plate VI, figs. 4 and 8). Some of the anterior ciliary arteries were ruptured, giving rise to hæmorrhage into the anterior chamber, which served to hide the lower part of the iris. The upper part had, together with the ciliary body, become so retracted that it was behind the sclero-corneal margin. Hence none of the iris could be seen through the cornea.

The lens capsule in all three cases was ruptured at its equator, and the fibres of the suspensory ligament inserted into it there were torn across, so that the lens became displaced, and the vitreous protruded forwards between its margin and the ciliary body. The free ends of the ruptured capsules were all found coiled outwards.

A case presenting itself in which, after a blow on the eye, the iris was found to have in part disappeared, the anterior chamber to have become deepened, and the lens displaced, would be diagnosed as one of retroflexion of the iris. The following description of this condition is given by Soelberg Wells :*

“A very peculiar and rare condition is that of retraction or depression of a portion of the iris, which is sometimes produced by blows upon the eye. The portion of the iris which is depressed is folded back upon itself, and the inner pupillary circle disappears at the point where this folding occurs; the peripheral portion of the iris is quite invisible, having sunk back out of sight, so that the eye at this point presents the appearance as if the iridectomy had been made quite up to the ciliary attachment.

* ‘Treatise on Diseases of the Eye,’ 3rd edition, p. 183.

On examining the eye with the oblique illumination, or with the ophthalmoscope, we cannot, however, detect a trace of the ciliary processes, as would be the case if the iris had been removed. In such cases the lens has generally been found partially dislocated or much diminished in size."

The often-quoted case of von Ammon's* is the one upon which the description of the pathological condition in this class of cases is based. A young soldier, wishing to commit suicide, loaded his musket with powder, and then, pouring a quantity of water into the barrel, placed the muzzle in his mouth, discharged the piece, and fell dead. In his right eye the only visible portion of the iris was a small crescentic piece on the outer side. The point where this portion disappeared was neither torn nor abruptly folded inwards, but disappeared without its being possible to discern what had become of it. Dissection showed that the upper, inner, and lower borders of the iris were pushed back; the vitreous body was displaced; the lens, with its capsule entire, touched the upper border of the middle of the superior ciliary processes, whilst the inferior border was found near the centre of the unnaturally large pupil. The lens and vitreous body had displaced the iris; when they were removed under water the iris slowly returned to its position.

My case shows that the same symptoms as those which I have quoted from Soelberg Wells may be produced by a rupture of the fibres of the ligamentum pectinatum, which allows of the retraction of the iris and ciliary body to such an extent that a portion may be completely withdrawn beyond the sclero-corneal margin, and consequently invisible by oblique illumination.

The almost complete absence of records of pathological examinations of concussion cataract was drawn attention to by Mr. Lawford in the 'Ophthalmic Review' for 1887. He gave a *résumé* of the opinions of different authors with regard to it, and recorded two cases, in both of which he

* 'Archiv für Ophthal.,' Bd. i, p. 119.

found a rupture of the capsule. With my cases we have now five concussion cataracts, all of which have been proved to have rents in their capsule; and, so far as I know, no case has been recorded where the capsule was definitely intact.

In conclusion, it is worthy of note that in these three cases in which the tension was diminished, the angle of the anterior chamber was abnormally widely open. It suggests that possibly an increased rate of exit of the intra-ocular fluids was thus permitted, so that even normal tension could not be maintained. This inference may, however, be fallacious, and the *minus* tension may have been due to arrested secretion.

CASE 1.—William R—, æt. 6, was struck on his left eye by a stone shot from a catapult on May 28th, 1890. He was at once brought to the Moorfields Hospital, when he was found to have a large abrasion of the cornea, a widely dilated pupil, some hæmorrhage into the anterior chamber, and displacement of his lens upwards, so that its lower margin could be seen. He was admitted into the hospital three days later under the care of Mr. Tay. The condition of his eye was then described as follows:—Slight œdema and redness of lids. Dilatation of conjunctival vessels. Superficial corneal haze. Anterior chamber deep. Iris sloping backwards and tremulous. Pupil widely dilated, one posterior synechia down and in. Lens opaque, displaced upwards and inwards. V. = hand movement. T. *minus*.

The eye was excised on June 5th, 1890, *i. e.* eight days after the injury.

Pathological examination showed that the deepening of the anterior chamber was due to the displacement backwards of the lens, iris, and inner portion of the ciliary body, the ciliary muscle being split in its entire circumference at the angle of the anterior chamber, which was thus prolonged outwards (Plate VI, fig. 1). Microscopically this split is seen to have occurred between the cir-

cular and longitudinal fibres, and that those fibres of the ligamentum pectinatum which pass to the anterior surface of the iris are also torn through (Plate VI, fig. 2). The lens was small and altered in shape, being thin at its upper margin and thick at its lower. Microscopical examination shows a rupture in its capsule in the equator at the lower part, the two ends of the ruptured capsule being widely retracted and coiled on themselves.

CASE 2.—Samuel S—, æt. 16, on June 28th, 1889, in throwing a stick over his shoulder, struck his left eye with it.

He was admitted into the Moorfields Hospital a fortnight later. The condition of the eye then was as follows:—Cornea misty. Anterior chamber very deep. Pupil irregular. Iris and lens of a greenish colour from discoloration of aqueous. Lens displaced upwards and outwards, its lower and inner margins being visible in the pupil. No fundus reflex. T. *minus*. V. = no p. l. The eye was excised the following day.

Pathological examination, made after hardening the eye in Müller's fluid, revealed a condition almost precisely similar to that described in Case 1. The fibres of the ligamentum pectinatum which pass to the base of the iris and ciliary muscle were split in their entire circumference, and to about the same extent as in Case 1 (Plate VI, fig. 3). The lens capsule had also ruptured at its equator in the lower part, being much wrinkled and twisted on each side. The epithelium on the anterior capsule was several layers thick, and the lens fibres in some parts showed considerable degeneration. The vitreous had come forward in the same way as in Case 1, between the lower margin of the lens and the ciliary body. There was an extensive hæmorrhage into it. The retina was partially detached at the upper and lower parts.

CASE 3.—For the specimen and notes of this case I am indebted to Mr. Lang. Frank C—, æt. 11, whilst looking

up at some fireworks on November 12th, 1890, was struck in his right eye by something descending. He was seen by a doctor some hours later, who found both lids ecchymosed and an abraded surface on the inner half of the upper lid. The eyeball itself presented several small burns, mostly in the region of the sclerotic, but one also on the cornea, which was dull and covered by a layer of lymph. There was chemosis of the conjunctiva, especially down and in.

On November 19th he was seen by Mr. Lang, who described the condition of the eye then as follows:—Lids slightly swollen; subconjunctival hæmorrhage and ciliary injection. Cornea hazy down and out, ? burn. Anterior chamber deep. Hyphæma one third, iris invisible, T.—1. Projection defective above and below, good in and out. V.=hand movement.

On November 25th the right eye was excised; the left was watery, but there was no hippus.

Pathological examination.—On section of the globe the lens was found opaque, small, and displaced downwards and backwards. The anterior chamber was much increased in depth; there were extensive blood-clots in it at the lower part. The iris above appeared to be much shrunken and retracted backwards, so as to be external to the sclero-corneal margin. The vitreous came forward between the upper margin of the lens and the ciliary body; there had been some hæmorrhage into it. It was slightly detached posteriorly. The retina was rucked.

Microscopical appearances.—The fibres of the ligamentum which pass to the iris and those which give origin to the ciliary muscle are torn across. The ciliary muscle has become separated from the sclerotic, and it, together with the iris and lens, are all displaced backwards, deepening the anterior chamber (Plate VI, figs. 4 and 5). There are blood-clots between the detached ciliary body and sclerotic on each side. Some of the branches of the anterior ciliary artery have evidently been torn across.

The lens capsule at its upper part has ruptured; there is wide separation of the ruptured ends, which are coiled up

outwards away from the lens substance. The fibres of the suspensory ligament at the upper part are all torn through, the vitreous coming forward into the anterior chamber between the upper margin of the lens and the ciliary body.

(October 15th, 1891.)

DESCRIPTION OF PLATE VI,

Illustrating Mr. Treacher Collins's paper on the Pathological Examination of Three Eyes lost from Concussion (page 180).

FIG. 1.—Section of front half of eye in Case 1, showing prolongation of the angle of the anterior chamber outwards, and displacement backwards of the iris, anterior portion of ciliary body, and lens.

FIG. 2.—Section of the angle of the anterior chamber in Case 1 more highly magnified. It shows the splitting which has occurred across the fibres of the ligamentum pectinatum and in the ciliary muscle.

FIG. 3.—Section of the angle of the anterior chamber in Case 2, showing much the same changes as in Fig. 2.

FIG. 4.—Section of the front half of the eye in Case 3, showing the separation of the ciliary body from the sclerotic, the blood-clots intervening, the displacement of the lens, and the advance of the vitreous between it and the ciliary body.

FIG. 5.—Section of one side of the iris, ciliary body, &c., in Case 3, more highly magnified. It shows how the whole of the ligamentum pectinatum had become torn through, and how much the iris had become shrunken and retracted.

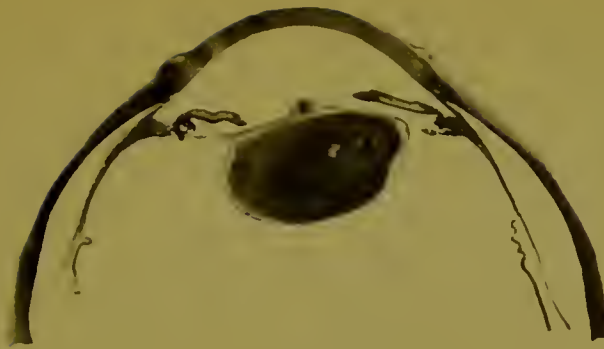


Fig. 1.

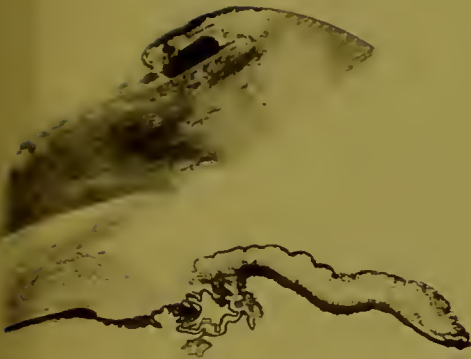


Fig. 2.



Fig. 3.



Fig. 4.

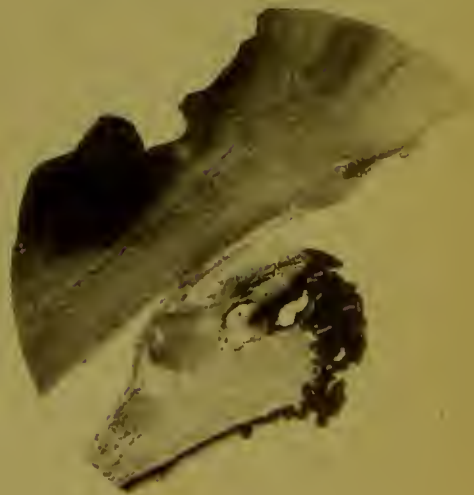


Fig. 5.



